U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Ranunculus hawaiensis*

COMMON NAME: Makou

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: August 2005

STATUS/ACTION

___ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

___ New candidate

__X_ Continuing candidate

___ Non-petitioned

_X__ Petitioned - Date petition received: May 11, 2004

_ 90-day positive - FR date:

_X_ 12-month warranted but precluded - FR date: May 11, 2005

_N_ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? _yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? _yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded. We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions. During the past 12 months, most of our national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, meeting statutory deadlines for petition findings or listing determinations, emergency listing evaluations and determinations and essential litigation-related, administrative, and program management tasks. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the past 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (http://endangered.fws.gov).

___ Listing priority change

Former LP: ___

New LP: ___

Date when the species first became a Candidate (as currently defined): 1990

___ Candidate removal: Former LP: __

___ A – Taxon is more abundant or widespread than previously believed or not subject to

the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

___ F – Range is no longer a U.S. territory.

___ I – Insufficient information exists on biological vulnerability and threats to support listing.

___ M – Taxon mistakenly included in past notice of review.

___ N – Taxon does not meet the Act's definition of "species."

___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Flowering plants, Ranunculaceae (Buttercup family)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, islands of Hawaii and Maui

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, islands of Hawaii and Maui

LAND OWNERSHIP: Populations of *Ranunculus hawaiensis* are found on State, private, and Federal lands.

LEAD REGION CONTACT: Paul Phifer, 503-872-2823, paul_phifer@fws.gov

LEAD FIELD OFFICE CONTACT: Pacific Islands Fish and Wildlife Office, Christa Russell, 808-792-9400, christa_russell@fws.gov

BIOLOGICAL INFORMATION:

Species Description *Ranunculus hawaiensis* is an erect or ascending perennial herb 5 to 20 decimeters (20 to 79 feet (ft)) tall with fibrous roots. Stems are densely covered with golden or whitish hairs. Basal leaves are twice compound, with leaflets lanceolate with the terminal one largest and irregularly toothed and lobed. The yellow, glossy flowers are numerous in branched open cymes and contain a scale-covered nectary at the base. Achenes are numerous in an ovoid head and are margined with a narrow wing (Wagner *et al*. 1999a).

Taxonomy *Ranunculus hawaiensis* was described by Asa Gray. This species is recognized as a distinct taxon in Wagner *et al*. (1999a) and Wagner and Herbst (2003), the most recently accepted Hawaiian plant taxonomy.

Habitat Typical habitat is mesic to wet forest dominated by *Metrosideros polymorpha* (`ohi`a) and *Acacia koa* (koa) with scree substrate at elevations between 1,820 and 2,040 meters (6,000 to 6,700 ft) (Bill Garnett, private consultant, pers. comm. 1996; Art Medeiros, U.S.G.S. Biological Resources Discipline, pers. comm. 1996, 1997 and 1999; Rick Warshauer, Research

Corporation of the University of Hawaii, pers. comm. 1997; Wagner *et al*. 1999a).

Historical and Current Range/Current Status *Ranunculus hawaiensis* is known from the islands of Hawaii and Maui, although its range on these two islands has declined. Populations formerly within Haleakala National Park have been extirpated. It is known from less than 300 individuals in five populations. However, the majority of these individuals are seedlings, less than 2.5 centimeters (1 inch) tall, and the rate of survival is expected to be very low (Bill Garnett, pers. comm. 1996; A. Medeiros, pers. comms., 1996, 1997, and 1999; R. Warshauer, pers. comm. 1997).

THREATS:
A. The present or threatened destruction, modification, or curtailment of its habitat or range. *Ranunculus hawaiensis* is threatened by feral goats (*Capra hircus*) and pigs (*Sus scrofa*) on both islands, by feral sheep (*Ovis aries*) on Hawaii, and feral cattle (*Bos taurus*) on Maui (A. Medeiros, pers. comms. 1996 and 1997; R. Warshauer, pers. comm. 1997; Linda Pratt, U.S.G.S. Biological Resources Discipline, pers. comm. 2005). As early as 1778, European explorers introduced livestock, which became feral, increased in number and range, and caused significant changes to the natural environment of Hawaii. Past and present activities of introduced alien mammals are the primary factor altering and degrading vegetation and habitats on Maui and the island of Hawaii. The pig is originally native to Europe, northern Africa, Asia Minor, and Asia. European pigs, introduced to Hawaii by Captain James Cook in 1778, became feral and invaded forested areas, especially wet and mesic forests and dry areas at high elevations. They are currently present on Kauai, Oahu, Molokai, Maui and Hawaii, and inhabit rain forests and grasslands. While rooting in the ground in search of the invertebrates and plant material they eat, feral pigs disturb and destroy vegetative cover, trample plants and seedlings, and threaten forest regeneration by damaging seeds and seedlings. They disturb soil and cause erosion, especially on slopes. Alien plant seeds are dispersed on their hooves and coats as well as through their digestive tracts, and the disturbed soil is fertilized by their feces, helping these plants to establish. Pigs are a major vector in the spread of many introduced plant species (Smith 1985; Stone 1985; Medeiros *et al*. 1986; Scott *et al*. 1986; Tomich 1986; Cuddihy and Stone 1990; Wagner *et al*. 1999a).

The goat, a species originally native to the Middle East and India, was successfully introduced to the Hawaiian Islands in 1792. Currently populations exist on Kauai, Oahu, Maui, and Hawaii. Goats browse on introduced grasses and native plants, especially in drier and more open ecosystems. Feral goats eat native vegetation, trample roots and seedlings, cause erosion, and promote the invasion of alien plants. They are able to forage in extremely rugged terrain and have a high reproductive capacity (Clarke and Cuddihy 1980; van Riper and van Riper 1982; Scott *et al*. 1986; Tomich 1986; Culliney 1988; Cuddihy and Stone 1990). Although many plant species survive on steep cliffs inaccessible to goats, the original range of these plants was probably much larger. Dry and mesic habitats were damaged in the past by goats, and these effects are still apparent in the form of alien vegetation and erosion. This species is threatened by direct damage from feral goats, such as trampling of plants and seedlings and erosion of substrate (Corn *et al*. 1979; Clarke and Cuddihy 1980; van Riper and van Riper 1982; Culliney 1988; Scott *et al*. 1986).

Cattle, the wild progenitor of which was native to Europe, northern Africa, and southwestern Asia, were introduced to the Hawaiian Islands in 1793. Large feral herds developed as a result of restrictions on killing cattle decreed by King Kamehameha I. While small cattle ranches were developed on Kauai, Oahu, and west Maui, very large ranches of tens of thousands of acres were created on east Maui and Hawaii. Much of the land used in these private enterprises was leased from the State or was privately owned and classified as Forest Reserve and/or Conservation District. Feral cattle can presently be found on the island of Maui. Cattle eat native vegetation, trample roots and seedlings, cause erosion, create disturbed areas into which alien plants invade, and spread seeds of alien plants in their feces and on their bodies. The forest in areas grazed by cattle becomes degraded to grassland pasture, and plant cover is reduced for many years following removal of cattle from an area. Several alien grasses and legumes purposely introduced for cattle forage have become noxious weeds (Tomich 1986; Cuddihy and Stone 1990).

Sheep have become established on the island of Hawaii (Tomich 1986) since their introduction almost 200 years ago (Cuddihy and Stone 1990). Sheep roam the upper elevation dry forests of Mauna Kea, Mauna Loa, and Hualalai (above 1,000 m (3,300 ft)), causing damage similar to that of goats (Stone 1985). Sheep have decimated vast areas of native forest and shrubland on Mauna Kea and continue to do so as a managed game species (Stone 1985; Cuddihy and Stone 1990).

Ungulate exclusion fences protect several of the known populations of this species; however, without continued monitoring and maintenance of those fences, pigs from surrounding areas can easily access fenced areas. In addition, the remaining, unfenced individuals of this taxon are still impacted by this threat.

B. Overutilization for commercial, recreational, scientific, or educational purposes.
None known.

C. Disease or predation.
Direct damage to *Ranunculus hawaiensis* by pigs has been observed on the island of Hawaii (R. Warshauer, pers. comm. 1997). Slug damage has been observed on *Ranunculus hawaiensis* in cultivation and in the wild (A. Medeiros, pers. comm., 1996, 1997). The effect of slugs on the decline of this and related species is unclear, although slugs may pose a threat by feeding on the stems and fruit, thereby, reducing the vigor of the plants and limiting regeneration (Loyal Mehrhoff, *Service, in litt*. 1994; S. Perlman, pers. comm. 1994).

D. The inadequacy of existing regulatory mechanisms.
Pigs, goats, and sheep are managed in Hawaii as a game animal, but many herds, especially of pigs and goats, populate inaccessible areas where hunting is difficult, if not impossible, and therefore has little effect on their numbers (Hawaii Heritage Program 1990). Goat, pig, and sheep hunting is allowed year-round or during certain months, depending on the area (Hawaii Department of Land and Natural Resources n.d.-a, n.d.-b, n.d.-c). However, public hunting does not adequately control the number of these ungulates to eliminate this threat to taxon. Hunting of feral cattle is no longer allowed in Hawaii (Hawaii Department of Land and Natural

Resources 1985) except under permitted conditions. Ungulate exclusion fences protect several of the known populations of this species; however, without continued monitoring and maintenance of those fences, feral ungulates from surrounding areas can easily access fenced areas. In addition, the remaining, unfenced individuals of this taxon are still impacted by this threat.

E. Other natural or manmade factors affecting its continued existence.
Numerous weed species threaten *Ranunculus hawaiensis* (A. Medeiros, pers. comms. 1996 and 1997; R. Warshauer, pers. comm. 1997). The original native vascular flora of Hawaii consisted of about 1,400 species, nearly 90 percent of which were endemic. Of the total native and naturalized Hawaiian flora of 1,817 taxa, 47 percent were introduced from other parts of the world, and nearly 100 species have become pests (Smith 1985; Wagner *et al.* 1999a). Several studies (Cuddihy and Stone 1990; Wood and Perlman 1997; Robichaux et al. 1998) indicate nonnative plant species may outcompete native plants similar to *Ranunculus hawaiensis* . Competition may be for space, light, water or nutrients, or there may be a chemical inhibition of other plants (Smith 1985; Cuddihy and Stone 1990). In addition, nonnative pest plants found in habitat similar to that of this species have been shown to make the habitat less suitable for native species (Smathers and Gardner 1978; Smith 1985; Medeiros *et al*. 1992; Loope and Medeiros 1992; Ellshoff *et al*. 1995; Meyer and Florence 1996; Medeiros *et al.* 1997; Loope *et al*. 2004). In particular, alien pest plant species modify habitat by modifying availability of light, altering soil-water regimes, modifying nutrient cycling, or altering fire characteristics of native plant communities (Smith 1985; Cuddihy and Stone 1990; Vitousek *et al*. 1987). Because of demonstrated habitat modification and resource competition by nonnative plant species in habitat similar to that of *Ranunculus hawaiensis* the Service believes nonnative plant species are a threat to this species. Nonnative plants are being controlled in some of the known populations of this species, but will probably never be completely eradicated because new propagules are constantly being dispersed into the fenced area from surrounding, unmanaged lands. Many widespread alien taxa cannot be completely eradicated from an island or the State, and therefore are expected to disperse into previously managed areas (Loope 1998, Smith 1985). The remaining populations of the species are still impacted by this threat.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED
The Service has provided funding through its Partners for Fish and Wildlife Programs to the University of Hawaii for *Acacia koa* forest habitat restoration on private lands on Maui that will benefit *Ranunculus hawaiensis* and other rare plants. On the island of Hawaii, funding was provided through a cooperative agreement between the Service and Parker Ranch for shrubland restoration at Waikii, on Mauna Kea. This effort will benefit *R. hawaiensis* in this area.

The Olaa-Kilauea Partnership has received Service funds (through the Hawaiian Silversword Foundation) to restore native forest to areas previously grazed by cattle within Kulani Correctional Facility. Restoration includes fencing to exclude ungulates, weed control, and propagation and outplanting of common native plant components, all of which will benefit individuals of *Ranunuculus hawaiiensis* in this area (Olaa-Kilauea Partnership 2005).

This species is represented in an *ex situ* collection at the Volcano Rare Plant Facility (U.S. Fish

and Wildlife Service Controlled Propagation Database 2005).

SUMMARY OF THREATS:
The major threats to this taxon are ungulates and nonnative plant species, which are believed to be a major cause of the decline of this species throughout its range. Feral ungulates have been fenced out of some of the populations of *Ranunculus hawaiiensis,* but the fences must be continually maintained to prevent incursion. Nonnative plants have been reduced in some of the populations that are fenced. These on-going conservation efforts for this species benefit only some of the known populations. The species as a whole is still impacted by these threats and will require long-term monitoring and management to maintain threat free areas. This species is represented in an *ex situ* collection.

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	**Imminent**	Monotypic genus	1
		Species	**2***
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:
Magnitude:
This species is highly threatened by feral pigs, goats, cattle, sheep and slugs that directly prey upon it and degrade and destroy habitat, and nonnative plants that compete for light and nutrients. Threats to the forest habitat of *Ranunculus hawaiensis* and to individuals of this species occur throughout its range and are expected to continue or increase without their control or eradication. Feral ungulates have been fenced out of some of the populations where *Ranunculus hawaiiensis* currently occurs, but the fences must be continually maintained to prevent incursion. Nonnative plants have been reduced in some of the populations that are fenced. These on-going conservation efforts for this species benefit only some of the known populations. The species as a whole is still impacted by these threats and will require long-term monitoring and management to maintain threat free areas. This species is represented in an *ex situ* collection.

Imminence:
Threats to *Ranunculus hawaiensis* from feral pigs, goats, cattle, sheep, slugs, and nonnative plants are considered imminent because they are ongoing.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No. The species does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the time frame of the routine listing process. In addition, individuals of *Ranunculus hawaiensis* will benefit from conservation actions initiated by the University of Hawaii, Parker Ranch, and the Olaa-Kilauea Partnership, and funded, in part, by the Service. These conservation actions include *Acacia koa* forest habitat restoration on private lands on Maui; shrubland restoration at Waikii, on the island of Hawaii; and removal of non-native plant species (*Morella faya*, *Psidium cattleianum*, and *Fraxinus uhdei*), and outplanting and maintenance of self-sustaining populations of *R. hawaiensis* in weed and ungulate-free fenced areas on the island of Hawaii. If it becomes apparent that the routine listing process is not sufficient to prevent large losses that may result in this species' extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of *R. hawaiensis* as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

DESCRIPTION OF MONITORING:
The information in this form is based on the results of two meetings of 20 botanical experts held by the Center for Plant Conservation in December 1995 and November 1996, who are cited where appropriate in the text and from Art Medeiros of U.S.G.S. Biological Resources Discipline in 1999. We have incorporated additional information on this species from our files and the most recent supplement to the *Manual of the Flowering Plants of Hawaii* (Wagner and Herbst 2003). In 2004 the Pacific Islands office contacted the following species experts: Bob Hobdy, retired from Hawaii Division of Forestry and Wildlife; Joel Lau, Hawaii Natural Heritage Program; Art Medeiros, U.S.G.S. Biological Resources Discipline; Hank Oppenheimer, resource manager for Maui Land and Pineapple Company; and Steve Perlman and Ken Wood, National Tropical Botanical Garden. No new information was provided in 2004. In 2005 we contacted the species experts listed below and confirmation of the status information was provided by Linda Pratt, U.S.G.S. Biological Resources Discipline.

The Hawaii Natural Heritage Program identified this species as critically imperiled (Hawaii Natural Heritage Program Database 2004). Based on the International Union for Conservation of Nature and Natural Resources Red Plant Data Book rarity categories, this species is recognized as Endangered (considered at risk of extinction) by Wagner *et al.* (1999b).

A species expert has provided new information confirming the status of the species this year and the results are included in this assessment.

COORDINATION WITH STATES:
In October 2004 we provided the Hawaii Division of Forestry and Wildlife with copies of our most recent candidate assessments for their review and comment. Vickie Caraway, the State botanist, reviewed the information for this species and provided no additional information or corrections (V. Caraway, pers. comm. 2005).

LITERATURE CITED
List all experts contacted:

Name	Date	Place of Employment
1. Joel Lau	June 28, 2005	Hawaii Natural Heritage Program
2. Art Medeiros	June 28, 2005	U.S.G.S. Biological Resources Discipline
3. Jim Jacobi	June 28, 2005	U.S.G.S. Biological Resources Discipline
4. Rick Warshauer	June 28, 2005	U.S.G.S. Biological Resources Discipline
5. Hank Oppenheimer	June 28, 2005	Maui Land and Pineapple Company
6. Kapua Kawelo	June 28, 2005	U.S. Army
7. Dave Lorence	June 28, 2005	National Tropical Botanical Garden
8. Steve Perlman	June 28, 2005	National Tropical Botanical Garden
9. Linda Pratt*	June 28, 2005	U.S.G.S. Biological Resources Discipline
10. Ken Wood	June 28, 2005	National Tropical Botanical Garden
11. Marie Bruegmann	July 13, 2005	U.S. Fish and Wildlife Service
12. Vickie Caraway	June 14, 2005	Hawaii Division of Forestry and Wildlife

*Provided new information on this taxon in 2005

List all databases searched:

Name	Date
1. Hawaii Natural Heritage Program	2004
2. U.S. Fish and Wildlife Service Controlled Propagation Database	2005

Other resources utilized:

Center for Biological Diversity, Dr. Jane Goodall, Dr. E.O. Wilson, Dr. Paul Ehrlich, Dr. John Terborgh, Dr. Niles Eldridge, Dr. Thomas Eisner, Dr. Robert Hass, Barbara Kingsolver, Charles Bowden, Martin Sheen, the Xerces Society, and the Biodiversity Conservation Alliance. 2004. Hawaiian Plants: petitions to list as federally endangered species. May 4, 2004.

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Cuddihy, L.W., and C.P. Stone. 1990. Alteration of native Hawaiian vegetation; effects of humans, their activities and introductions. Coop. Natl. Park Resources Stud. Unit, Hawaii. 138 pp.

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Ellshoff, Z.E., D.E. Gardner, C. Wikler, and C.W. Smith. 1995. Annotated bibliography of the genus *Psidium*, with emphasis on *P. cattleianum* (strawberry guava) and *P. guajava* (common guava), forest weeds in Hawai`i. Cooperative National Park Resources Studies Unit, University of Hawaii. Technical Report 95.

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Hawaii, Department of Land and Natural Resources. N.d.-c. Summary of Title 13, Chapter 123, Game mammal hunting rules, island of Maui. Division of Forestry and Wildlife, Honolulu. 2 pp.

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Loope, L.L. and A.C. Medeiros. 1992. A new and invasive grass on Maui. Newsletter of the Hawaiian Botanical Society 31: 7-8.

Loope, L., F. Starr and K. Starr. 2004. Management and research for protecting endangered Hawaiian plant species from displacement by invasive plants on Maui, Hawaii. Weed Technology 18: 1472-1474.

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Medeiros, A.C., L.L. Loope, T. Flynn, S.J. Anderson, L.W. Cuddihy, and K.A. Wilson. 1992. Notes on the status of an invasive Australian tree fern (*Cyathea cooperi*) in Hawaiian rain forests. American Fern Journal 82: 27-33.

Meyer, J.-Y. and J. Florence. 1996. Tahiti's native flora endangered by the invasion of *Miconia calvescens* D.C. (Melastomataceae). Journal of Biogeography 23: 775-781.

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Robichaux, R., J. Canfield, F. R. Warshauer, L. Perry, M. Bruegmann, and G. Carr. 1998. Adaptive Radiation. Endangered Species Bulletin. November/December.

Scott, J.M., S. Mountainspring, F.L. Ramsey, and C.B. Kepler. 1986. Forest bird communities of the Hawaiian Islands: Their dynamics, ecology, and conservation. Studies in Avian Biology 9:1-429. Cooper Ornithological Society, Los Angeles.

Smathers, G.A. and D.E. Gardner. 1978. Stand analysis of an invading firetree (*Myrica faya* Aiton) population, Hawai`i. Proceeding of the Second Conference on Natural Science, Hawaii Volcanoes National Park, pp. 274-288.

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Tomich, P.Q. 1986. Mammals in Hawai`i; a synopsis and notational bibliography. Bishop Museum Press, Honolulu. 375 pp.

van Riper, S.G., and C. van Riper III. 1982. A field guide to the mammals in Hawaii. The Oriental Publishing Company, Honolulu. 68 pp.

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Wagner, W.L., M.M. Bruegmann, and J.Q.C. Lau. 1999b. Hawaiian vascular plants at risk: 1999. Bishop Mus. Occas. Pap. 60: 1-58.

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes to the candidate list, including listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all 12-month petition findings, additions of species to the candidate list, removal of candidate species, and listing priority changes.

Approve: Acting _____ 11/16/05
Regional Director, Fish and Wildlife Service Date

Concur: _____ August 23, 2006
Director, Fish and Wildlife Service Date

Do not concur: _____ _____
Director, Fish and Wildlife Service Date

Date of annual review: September 20, 2005
Conducted by: Marie M. Bruegmann, Pacific Islands FWO
Plant Recovery Coordinator

Comments:
PIFWO Review

Reviewed by: Christa Russell Date: September 22, 2005
Plant Conservation Program Leader

Gina Shultz Date: October 14, 2005
Assistant Field Supervisor,
Endangered Species

Patrick Leonard Date: October 14, 2005
Field Supervisor